INCH-POUND

MIL-PRF-1/1590D
17 August 2004
SUPERSEDING
MIL-PRF-1/1590C
19 July 1999

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, THYRATRON
TYPE 8613

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the electron tube described herein shall consist of this document and the latest issue of MIL-PRF-1.

DESCRIPTION: Triode, hydrogen, ceramic-metal.

See figure 1.

Mounting position: Any.

Weight: 1 pound 2 ounces (510.3 grams) nominal.

ABSOLUTE RATINGS:

Parameter:	Ef	epy	epx	Ebb	egy	egx	Ecc	$\frac{dik}{dt}$	ib
Unit:	V ac	kv	kv	kV dc	v	v	V dc	a/µs	a
Maximum:	6.8 4/	16.0 1/	16.0 2/	---	600 3/	200	200	2,000	500
Minimum:	5.8	2	5% epy	1.0	175	---	---	---	---
Test conditions:	6.3	---	---	---	175	---	0	---	---

ABSOLUTE RATINGS:

Parameter:	Ip	Ib	tk	prr	Pb	tj	TA	Cooling
Unit:	A ac	A dc	sec	---	---	µs	°C	---
Maximum:	8.0	0.5	---	---	10.0×10^9	0.005	125	5/
Minimum:	---	---	180	---	---	6/	---	---
Test conditions:	---	---	180	2,000	---	---	Ambient	---

See footnotes at end of table I.

GENERAL:

Qualification: Required.

TABLE I. Testing and inspection.

Inspection	Method MIL-STD-1311	Notes	Conditions	Acceptance Level 16/	Symbol	Limits		Unit
						Min	Max	
Conformance inspection, part 1								
Instantaneous starting	3267	9/ 10/	epy = 16.0 kV dc (min); Ef = 6.8 V ac	0.65	---	---	---	---
Operation (1)	3246	4/ 9/ 11/	epy = 18.0 kV dc; Ef = 5.8 V ac	0.65	egy	---	175	v
Anode delay time	3256	---	Operation (1); t = 120	0.65	tad	---	0.50	µs
Anode delay time drift	3256	12/	Anode delay time	0.65	Δtad	---	0.10	µs
Heater current	3241	---	Ef = 6.3 V ac	0.65	If	6.0	11.5	A ac
DC anode voltage for conduction	3247	---	Ef = 5.8 V ac	0.65	Ebb	---	1,000	V dc
Pulse emission	3251	---	ik = 500 a; tp = 5.0 µs ± 10 percent; tr = 0.5 µs (max); prr = 60 ± 10 percent time interval = 2.5 µs	0.65	egk	---	175	v
Conformance inspection, part 2								
Sweep-frequency vibration	1031	8/	10 to 2,000 Hz	---	---	---	---	---
Sweep-frequency vibration end points:	---							
Operation (1)	3246	---		---	egy	---	175	v
DC anode voltage for conduction	3247	---		---	Ebb	---	1,000	V dc
Time jitter	3261	---		---	tj	---	0.005	µs
Operation (2)	3246	11/	Operation (1); Ef = 6.8 V ac; tk = 180 seconds	---	egy	---	175	v
Operation (3)	3246	14/	epy = 14.0 kV dc; prr = 2,500; Ef = 5.8 V ac; t = 300 seconds	---	egy	---	175	v
Time jitter	3261	13/	Operation (1), except epy = 8 kv	---	tj	---	0.005	µs

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Method MIL-STD-1311	Notes	Conditions	Acceptance Level 16/	Symbol	Limits		Unit
						Min	Max	
Conformance inspection, part 3								
Life test	---	9/	Group C; operation (1); t = 1,000 hours	---	---	---	---	---
Life-test end points:	---							
Operation (1) and (2)	3246	---		---	egy	---	200	v
Anode delay time	3256	---		---	tad	---	0.6	µs
DC anode voltage for conduction	3247	---	egy = 200 v	---	Ebb	---	1,250	V dc
Time jitter	3261	---	egy = 200 v	---	tj	---	0.010	µs
Shock	1041	7/	100 G	---	---	---	---	---
Shock test end points:	---							
Operation (1)	3246	---		---	egy	---	175	v
DC anode voltage for conduction	3247	---		---	Ebb	---	1,000	V dc
Time jitter	3261	---		---	tj	---	0.005	µs
Operation at elevated ambient temperature	3246	7/ 9/ 15/	TA = +125°C; t = 5 hours	---	egy	---	175	v

1/ Instantaneous starting is permissible. The maximum permissible instantaneously applied epy is 16 kv and shall not be attained in less than 0.04 second.

2/ In pulsed operation, the peak inverse voltage, exclusive of a spike of 0.05 µs (maximum) duration, shall not exceed 5 kv dc during the first 25 µs following the anode pulse.

3/ The driver pulse, measured at tube socket with thyratron grid disconnected, shall have the following characteristics: Amplitude per ratings; tr = 0.35 µs (maximum); tp = 2.0 µs (minimum); Zg = 250 to 500 ohms. At -55°C, 200 V (minimum) shall be required.

4/ The optimum reservoir voltage for operation in accordance with operation (1) conditions shall be 6.3 V ac and shall be held to within ± 7.5 percent.

5/ A cooling airblast of 10 cubic feet per minute (cfm) may be directed into the anode cup when operating at maximum anode dissipation.

6/ Appreciably less jitter than 0.005 µs can be realized if the anode voltage is 8.0 kv or more, the grid-drive amplitude is near the maximum and the grid-drive impedance is near minimum.

7/ This test shall be performed during the initial production and once each succeeding 12-calendar months in which there is production. An accept on zero defect sampling plan shall be used, with sample of three tubes with an acceptance number of zero. In the event of failure, the test will be made as a part of conformance inspection, part 2, with an acceptance level of 6.5 (see 16/). The "12-calendar month" sampling plan shall be reinstated after three consecutive samples have been accepted.

8/ There shall be no pronounced resonance in the range from 10 to 2,000 Hz.

TABLE I. Testing and inspection - Continued.

9/ The circuit constants shall be chosen under resonant charging conditions so that: epy = 18.0 kv, ib = 180 a (minimum); $\frac{dik}{dt}$ = 1,500 a/µs (minimum); tp = 1.0 ± 10 percent µs; prr = 1,000 (minimum).

Grid pulse characteristics shall be: tr = 0.35 µs (minimum); tp = 2.0 µs (maximum); and driver impedance = 500 ohms (minimum).

10/ The tube shall operate satisfactorily on push-button starting within three attempts when the anode voltage (epy) is applied to the tube under test in such a manner as to rise from 0 to 16.0 kv (minimum) within 0.03 second. (The filter in the rectifier shall be designed so that the epy reaches at least 7.0 kv within 0.015 second).

11/ The tube shall operate continuously for 10 minutes.

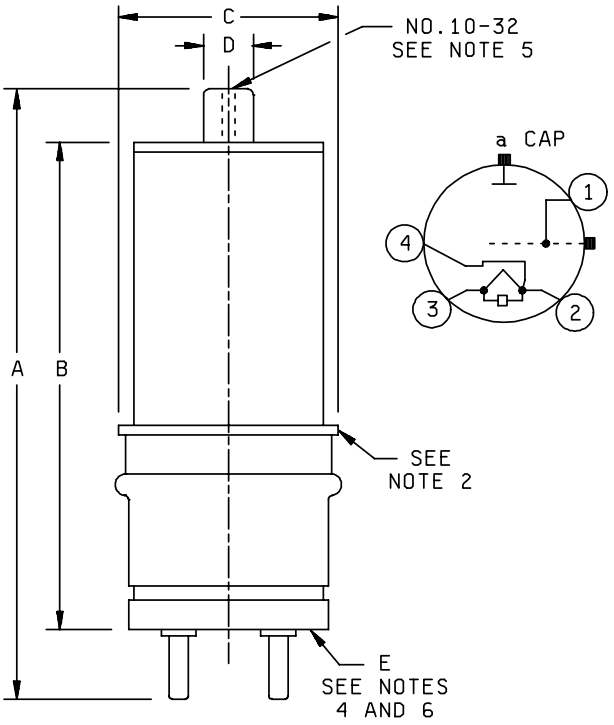
12/ This test shall be performed simultaneously with the operation (1) test. An anode delay time measurement shall be made at the end of 2 and 10 minutes of the operation (1) test. The change in anode delay time (with respect to the 2-minute reading) shall not exceed the value specified herein at any time during this test.

13/ The tube shall be tested by applying a peak forward anode voltage not to exceed that specified in the test conditions for the time jitter test immediately after the cathode warmup period (tk). The variation in firing time (tj), shall be not greater than the amount specified herein after 60 seconds of operation.

14/ The circuit constants shall be so chosen that the epy = 14.0 kv; ib = 130 a (minimum); $\frac{dik}{dt}$ = 1,250 a/µs (minimum); tp = 0.4 µs ± 10 percent; prr = 2,500 (minimum). Grid pulse shall be the same as 9/.

15/ This test shall be conducted for a total of 5 consecutive hours with no more than three kickouts and with no evidence of detrimental anode heating. The tube shall be started with Ef = 107.5 percent V ac and operate at this value for 4 hours. At the start of the fifth hour and while the tube is still operating, the filament voltage shall be lowered to Ef = 92.5 percent V ac and remain there for the final hour of operation.

16/ This specification sheet uses accept on zero defect sampling in accordance with MIL-PRF-1, table III.



Pin connections	
1	g
2	h, k, r
3	h, r
4	k
cap	a

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
Conformance inspection, part 2				
A	6.125	6.625	155.58	168.28
B	4.750	5.150	120.65	130.81
C	2.000	2.375	50.80	60.33
D	.559	.573	14.20	14.55
Conformance inspection, part 3 (see note 6)				
E	Base: A4-18 (EIA)			

NOTES:

1. Do not use metal clamp on ceramic envelope.
2. This flange is mechanically and electrically connected to the grid.
3. Recommended anode connected: Lightweight spring-clip type (National Co. type 12, or equivalent).
4. The cathode shall be isolated from the base.
5. In certain applications, it may be necessary to extend the anode connector as follows:
   To replace a 6587 tube type with an 8613, screw the anode adapter marked 6587 firmly into the 8613 anode connector (see figure 1A).
   To substitute a 8613 tube type for a 5C22, screw the anode adapter marked 5C22 firmly into the 8613 anode connector (see figure 1B). CAUTION: Such substitution may require some equipment modification."
6. Dimensions shall be checked during the initial production and once each succeeding 12-calendar months in which there is production. An accept on zero defect sampling plan shall be used, with sample of three tubes with an acceptance number of zero. In the event of failure, the test will be made as a part of conformance inspection, part 2, with an acceptance level of 6.5 (see 16/). The "12-calendar month" sampling plan shall be reinstated after three consecutive samples have been accepted.

FIGURE 1A. Outline drawing of electron tube type 8613.

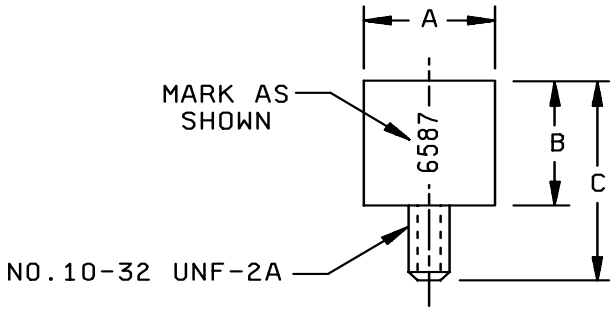


FIGURE 1A

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
Conformance inspection, part 2				
A	.561	.571	14.25	14.50
B	.610	.640	15.49	16.26
C	.875	1.125	22.23	28.58
D	.561	.571	14.25	14.50
E	2.110	2.140	53.59	54.36
F	2.375	2.625	60.33	66.68

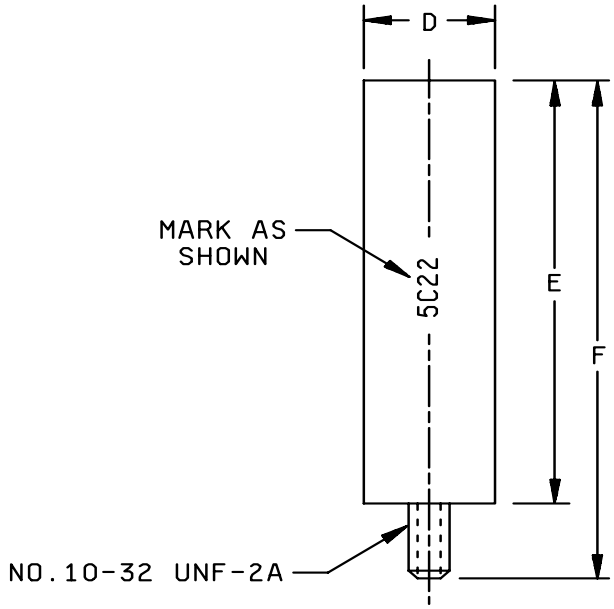


FIGURE 1B

NOTE: Unless otherwise specified, tolerance is ±.015 inch (0.13 mm).

FIGURE 1B. Outline drawing of electron tube type 8613 - Continued.

NOTES

Referenced documents. In addition to MIL-PRF-1, this specification sheet sheet references MIL-STD-1311.

Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the previous issue.

Custodians:
Army - CR
Navy - EC
Air Force - 11
DLA - CC

Preparing activity:
DLA - CC

(Project 5960-3748)

Review activities:
Army - CR4
Navy - AS, CG, MC, OS
Air Force - 99

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at www.dodssp.daps.mil.